The Challenge of Evaluating Situated Display based Technology Interventions Designed to Foster 'Sense of Community'

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ABSTRACT
In this paper we discuss the obdurate problems associated with evaluating the extent to which technological interventions – in particular those based on mobile and ubiquitous technologies – can be judged to have 'improved a sense of community ' in their given deployment settings. We report on experiences gained from several deployments of ubiquitous systems that share this design goal, and analyze common issues we observed during real life use of these systems. Based on these we discuss some of the key challenges for evaluating ubiquitous systems of this genre.

Author Keywords
Technological intervention, mobile and ubiquitous computing, CSCW, long-term deployment, evaluation, methods, community, situated displays.

ACM Classification Keywords
H5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

INTRODUCTION
Our research is interested in the design of technical systems that may prove useful in promoting or 'affording' some sense of community. McMillan and Chavis [11] identify four inter-related elements associated with sense of community:

i. *membership,*
ii. *influence,*
iii. *integration and fulfillment of needs,* and,
iv. *shared emotional connection.*

A number of technical systems based around ubicomp technologies, most notably situated displays, have recently been developed and deployed with the intention of supporting sense of community. A good overview of this work is provided in [14] with one of the first systems of this genre being GroupCast [10]. Typically such systems focus on highlighting the technical difficulty associated with implementing the system or the methods used to ensure appropriate and well-informed design. However, in addition to the difficulty of successfully designing and implementing systems, the evaluation of their 'success', i.e. their ability to foster and support a sense of community, is also a challenging problem, due to a number of issues. For example, when deploying technologies to support community it is likely that social practices will shift in order to accommodate the new technology. Furthermore, it is likely that the technology will be tailored by its users, sometimes in unanticipated ways (i.e. through appropriation) to accommodate the social practices it is intended to support. For example, technology can reshape notions of space and proximity and thus the boundaries of 'community', re-conceptualizing what it means to be local, connected etc. Hence, community is an achieved social construct, a 'persuasion', of mutual ties, orientations and obligations, pointing to the ability of technology to reshape and redefine how people see themselves [13].

One of the difficulties of evaluating how well a given technological intervention may support notions of community is that the effect of the intervention is dependent on the interaction between a combination of technologies and their affordances (including those brought about through the placement of the technologies) and particular communities and their dynamics. Furthermore, the evaluation techniques themselves must adapt to these dynamics, evolving alongside the system.

In [15] we discuss the need to consider the following factors when designing technologies to support notions of community:

1. *membership* - recognisable members and membership categories, allied with recognisable boundaries
2. *identity and representation* - how people can represent themselves and manage their 'identities'
3. *managing spatial relations* - need to manage spatial relations to integrate the real and the virtual

UbiComp '08 Workshop W2 -- Ubiquitous Systems Evaluation (USE '08)
September 21st, 2008
This position paper is not an official publication of UbiComp '08.

4. *rhythms* - the highly predictable rhythm of everyday activity sets the grounds for shared expectations and comprehension of behaviour - successful communities carry intelligible rhythms of interaction and awareness - which vary according to the community and is linked to issues of awareness and 'sense of place'.
5. *community development* - the community should be able to reflect and learn from experience, to develop 'robust sociality'
6. *history and change* - the ability to develop a history through recording and archiving various interactions

The remainder of this paper is structured as follows. In section two we describe our general approach towards the design, deployment and evaluation of technology interventions (where sense of community is at least one of the aims) in a range of settings. Next, in section three, we summarise two of our current deployments for which we wish to evaluate their effectiveness in supporting sense of community. These two deployments comprise the Wray Photo Display, a touch screen based interactive system, which is situated in the Post Office of a rural village in the North of England, and the Campus Coffee Display, a wall-mounted broadcasting screen, which is situated in a café at the intersection of Newcastle University's campus and the city's main shopping area. In this respect both systems are located within the activity zone of established local communities and visitors to the area. Finally, we discuss the pertinent issues that we have experienced when considering the evaluation of these systems.

APPROACH

It is apparent from related literature and our own research that it is essential to understand the social and physical richness of a given setting in order to avoid inappropriate design. Consequently, our approach draws from a range of approaches including ethnographic studies, use of cultural and technology probes [6], focus groups and design workshops. We have investigated several settings in the course of our studies including Lancaster University campus, a public café, and domestic settings such as family homes and residential care facilities.

By using a range of settings we aim to increase our confidence in the generality of our findings. Our methodology is iterative: observe, design and deploy, observe etc., where these stages are closely coupled and all hold key (technical and practical) challenges.

Our general approach is one of 'co-realisation' [5] whereby technical modification is rooted in ongoing ethnographic study. The evaluation approach, therefore, both informs and is being informed by the evolving character of the system to reflect the dynamic relationship between the system and its socio-spatial context.

SYSTEM DEPLOYMENTS

We have experienced 'community' use with several of our deployed systems based around 'situated' displays. For example, with the Hermes office door display system (that enabled office owners to post awareness related messages on digital displays situated outside their office) we describe in [2] how usage of the system was considered by many users as directly relating to notions of community, e.g. one door display owner made the following comment when asked why he used the system:

"there is a community associated with my doorplate, you know people have to be able to get to my doorplate, and that probably makes them one of the staff or colleagues, and that affects what information I could put on there and I don't want burglar Bill with his web browser to go – oh look [name]'s in such-and-such I'll go and burgle his house now."

In the following sub-sections we describe two of our current technology deployments that are undergoing evaluation and which were designed to support notions of community.

The Wray Photo Display

The Wray Photo Display [16] is deployed in the Post Office of a rural village situated in the North of England. The system enables members of the village to post photos (or short video clips) to be shown on the display and to create and moderate their own photo categories. The photo display was conceived as a technology probe and has run continuously (capturing log data) in its current location (see figure 1 below) since October 2006.

Figure 1. The Wray Photo Display situated in the Village Post Office. The Comments Book can be seen just to the right of the display.

In order to evaluate the usability and usefulness of the system we have held a number of participatory design workshops and focus groups. However, perhaps the most useful single method for obtaining qualitative feedback regarding the system has been via a comments book which has been placed next to the display since its first deployment. This book has enabled both members of the village and visitors to the village to express their opinions regarding the display and its content. To date over 60

individual comments have been left in the comments book but suggestions for additional functionality have also been left via e-mail. A page from the comments book containing a comment relating to issues of community is shown in figure 2.

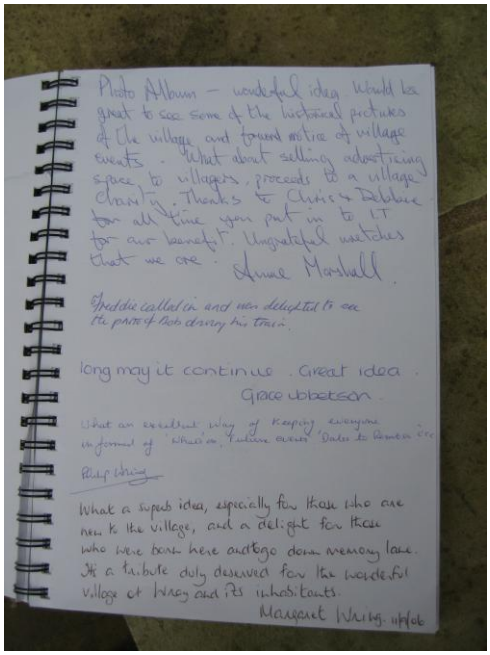

Figure 2. A Sample Page from the Wray Photo Display Comments Book.

The last comment on this page reads:

"What a superb idea, especially for those that are new to the village, and a delight for those who were born here and to go down memory lane..."

It is interesting to note that this comment speaks of notions of *membership*, *identity* and *history* that were introduced earlier. Indeed the most popular category of photos viewed on the display is that of historical photos.

Campus Coffee

The Campus Coffee system at a local café (see figure 3) has been running continuously for about two years now [7,8]. It provides information about upcoming cultural events in the quarter of the city where the café is located. The initial version of the system delivered content updated by the researchers and was designed to be non-interactive and slow-paced. As a new addition to other modes of local information in the café, it functions as a low-key technology probe.

In order to assess the customers' perception of the system as a source of local information and to look into options for further community engagement through the incorporation of interactive features, we conducted brief in-situ questionnaires, observations and focus group sessions. In line with previous findings, users most frequently classified their use of the system as opportunistic, i.e. glancing at it while waiting at the counter. Nevertheless, the display was perceived as being beneficial as a reminder about upcoming local events and complementary to other similar community resources, such as the weekly newsletter. The slow pace of the presentation was also positively received as being in line with the general 'feel' and use of the café.

In the course of the focus study we discussed with the participants three alternative designs of a more interactive system that would enable customers to interact with the display through their mobile phone. The proposed interactive features would provide a means for visitors to the café to comment either on the cultural events currently being shown on the screen, or on objects exhibited at nearby museums, or on user-defined topics. Feedback from the focus study indicated that, although the public nature of the display might serve well the promotion of community activities, the ownership of the content, its management, and the protocols of content contribution (including the interaction mechanisms) would be difficult to negotiate in such a socially and politically diverse environment.

Figure 3. The Campus Coffee display 'in the wild'.

Regarding this latter finding, we return to the comment made in the introduction, and the fact that here what is being evaluated is the product of both setting and technology.

ISSUES

In applying our approach to these deployed systems, we have come across a series of recurring issues, which we discuss in this section.

How long does a deployment need to be in place?

Both the Wray Photo Display and Campus Coffee systems have been deployed for relatively long periods of time – especially in the context of typical ubicomp systems. However, the question remains: how long does a deployment need to be in place before it can sensibly be evaluated against success criteria based on improved community and coordination in the setting? A key element of our research methodology is the use of substantial deployed installations. The long term use of novel

technologies, especially their collaborative and community effects, cannot be deeply understood through short-term experiments or 'toy' installations. This development and deployment enables longitudinal studies as well as being a technology demonstrator for dissemination and inspiration.

What are appropriate techniques for evaluating technology probes with respect to community?

We have utilized both qualitative and quantitative measures but to-date it is the use of qualitative methods that have yielded most insight. One problem with the use of quantitative measures based on log analysis, for example, is that it is difficult to produce figures on how many different members of a community view the content (not least how they feel about the content). With the Wray system, we did not wish for the interaction design to require viewers of the content to log themselves in and out of the system, as is often the case with similar systems [10,4]. There is the possibility of exploring the use of monitoring devices such as web cams but these, of course, introduce numerous and difficult privacy and control issues, see [12] for an initial discussion on this topic. We have also highlighted additional complexity added to this issue by the need to adapt our evaluation approach to individual communities and technologies.

How to introduce the system to the community?

The Wray Photo Display was introduced as a working interactive system, and has evolved over time in response to user feedback. With the Campus Coffee system we took a slightly more conservative approach by repurposing an existing non-interactive and very ambient system with the scope to introduce interactive aspects in response to user consultation. While both systems are relatively similar in the function they provide, specifically the delivery of community/locale related content, the reaction to them has been quite different. In particular, the interactive features associated with the Wray Photo Display have been received enthusiastically, but with the Campus Coffee system the suggestion of altering the design concept of the existing technology deployment to one in which a great degree of community-generated content could be entered and displayed received negative reaction. It is interesting to speculate on how the Campus Coffee deployment would have been received if the initial deployment had been based on this suggested design concept. The implication for evaluation being that the way a technology intervention is introduced can have a significant impact on the adoption and appropriation of the technology (to support sense of community).

CONCLUDING REMARKS AND FUTURE WORK

In this paper we have discussed the difficult issue of how to evaluate the success of technology interventions that have 'supporting notions of community' as their design goal. The two systems presented in this paper, which both share the aforementioned design goal, are based around situated display technologies and have been deployed for relatively long periods of time and received daily use. The Wray Photo Display system has certainly received positive comments from members of the community; however, questions over its 'inclusivity' still remain. With the Campus Coffee system it has been interesting to observe the cost/benefit analysis that has led participants of a focus study group to favor calm/controlled content presentation over potential haphazard community generated content. Clearly part of the cost/benefit analysis taking place in this case is informed by the participants' use of the café in the first place. Therefore, it highlights strongly the fact that with the technology interventions discussed in this paper, what is being evaluated is the product of both setting and technology – and this reveals the emphasis in *situated* displays. Furthermore, it indicates that an evaluative approach that would investigate the correlation between community dynamics and system usage patters and perceptions might be particularly helpful in the design of sustainable community-centered technology.

As part of our future work, we hope to extend our use of qualitative evaluation methods but also explore further the potential of more quantitative methods, such as the use of 'Sense of Community Index' developed from the field of psychology [3, 9]. We also hope to explore how to design and evaluate technology interventions to support a sense of community in further different and (again difficult to study) sensitive settings, including rural townships in South Africa.

ACKNOWLEDGMENTS

This work is supported by the EPSRC funded CASIDE project (grant ref: EP/C005589) and a Microsoft Research PhD Scholarship. We would like to thank the villagers of Wray and the staff and visitors of Campus Coffee as well as the student union of Newcastle University.

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